

APPENDIX C

(CLEAN VERSION OF ALL PENDING CLAIMS)

(Serial No. 09/544,822)

CLAIMS

What is claimed is:

1. A method for applying a material between a semiconductor device having a surface and a substrate having a surface, said method comprising:
applying a wetting agent layer to one of said surface of said semiconductor device and said surface of said substrate; and
applying a flowable material between the substrate and the semiconductor device.
- B1 2. (Amended) The method according to claim 1, wherein said semiconductor device is attached to said substrate.
3. The method of claim 1, wherein said wetting agent layer includes a layer of silane.
- B2 4. (Amended) The method according to claim 1, wherein said applying said wetting agent layer comprises any one of a dispensing method, a brushing method, and a spraying method.
5. The method according to claim 1, wherein said wetting agent layer comprises at least one layer.
6. The method according to claim 1, wherein said wetting agent layer comprises one or more layers.
7. The method according to claim 1, wherein said wetting agent layer comprises a plurality of layers.

8. The method according to claim 1, wherein said wetting agent layer comprises one of glycidoxypropylnethoxysilane and ethyltrimethoxysilane.

9. (Amended) The method according to claim 1, wherein said applying said wetting agent layer comprises providing a material for increasing the surface tension to one of said active surface and said top surface for the application of an underfill material.

10. (Amended) A method for applying a material between a semiconductor device and a substrate, said method comprising:
providing a semiconductor device having an active surface, another surface, a first end, a second end, a first lateral side, and a second lateral side, said first end, said second end, said first lateral side, and said second lateral side forming at least a portion of a periphery of said semiconductor device;
providing a substrate having an upper surface, a first side wall, a second side wall, a first lateral side wall and a second lateral side wall;
applying a wetting agent layer to one of said active surface of said semiconductor device and said upper surface of said substrate; and
applying a flowable material between said semiconductor device and said substrate.

11. (Amended) The method according to claim 10, wherein said flowable material is applied substantially adjacent to at least one end of said semiconductor device.

12. (Amended) The method according to claim 10, wherein said flowable material substantially fills a gap between said semiconductor device and said substrate.

13. The method according to claim 10, wherein said substrate includes an aperture extending through said substrate.

Bt 14. (Amended) The method according to claim 13, wherein said aperture is located adjacent to said another surface of said semiconductor device.

15. (Amended) The method according to claim 10, wherein said flowable material is provided substantially adjacent to said at least a portion of the periphery of said semiconductor device to fill a gap between said substrate and said semiconductor device.

16. The method according to claim 10, further comprising:
elevating at least said first side wall of said substrate and said first end of said semiconductor device.

B5 17. (Amended) The method according to claim 16, wherein said elevating said first side wall of said substrate comprises placing said substrate on a support structure and elevating at least one portion of said support structure.

18. The method according to claim 16, further comprising:
providing a dam on the substrate adjacent to at least one of said first end, said second end, said first lateral side and said second lateral side of said semiconductor device.

19. The method according to claim 18, wherein said dam extends to substantially between said semiconductor device and said substrate.

20. The method of claim 10, further comprising:
vibrating one of said semiconductor device and said substrate.

21. The method according to claim 20, wherein said vibrating one of said semiconductor device and said substrate comprises placing said substrate on a support structure and vibrating said support structure.

22. (Amended) The method according to claim 10, wherein said applying said flowable material comprises:

providing said flowable material substantially adjacent said first end of said semiconductor device for filling between said substrate and said semiconductor device by one or more forces acting upon said flowable material.

23. (Amended) The method according to claim 10, wherein said substrate includes at least one aperture extending through said substrate and substantially located adjacent to said another surface of said semiconductor device.

24. (Amended) The method according to claim 23, wherein said flowable material is provided through said at least one aperture of said substrate substantially filling a gap between said substrate and said semiconductor device.

25. (Amended) The method according to claim 18, wherein said applying said flowable material comprises:
providing said flowable material substantially adjacent to said first end of said semiconductor device for filling a gap between said substrate and said semiconductor device.

26. (Amended) The method according to claim 18, wherein said applying said flowable material comprises:
providing said flowable material substantially adjacent to said first end and one of said first lateral side and said second lateral side of said semiconductor device for filling a gap between said substrate and said semiconductor device.

27. (Amended) The method according to claim 18, wherein said substrate includes at least one aperture extending therethrough and substantially located adjacent to said another surface of said semiconductor device.

28. The method according to claim 27, wherein said flowable material is provided through said at least one aperture.

29. The method according to claim 28, wherein said flowable material is provided from below said substrate.

30. (Amended) The method according to claim 28, wherein said flowable material is provided through said at least one aperture contacting at least a portion of said another surface of said semiconductor device.

B7 31. (Amended) The method according to claim 10, wherein said applying said flowable material between said semiconductor device and said substrate further comprises placing said semiconductor device and said substrate in a chamber, said chamber having an atmosphere therein having a variable pressure.

32. (Amended) The method according to claim 31, further comprising: varying the pressure of said atmosphere in said chamber for said flowable material substantially filling a gap between said semiconductor device and said substrate.

33. (Amended) A semiconductor device comprising:
the semiconductor device having an active surface, at least a portion of said active surface having a wetting agent layer thereon.

34. (Amended) The semiconductor device according to claim 33, wherein said wetting agent layer includes silane.

35. The semiconductor device according to claim 33, wherein said wetting agent layer includes at least one layer.

36. The semiconductor device according to claim 33, wherein said wetting agent layer comprises one of glycidoxypopyltinethoxysilane and ethyltrimethoxysilane.

B⁸ 37. (Amended) The semiconductor device according to claim 33, wherein said wetting agent layer reduces surface tension of said active surface.

38. A semiconductor assembly comprising:
a semiconductor device having an active surface;
a substrate having an upper surface; and
a wetting agent layer provided on one of said active surface of said semiconductor device and said upper surface of said substrate.

39. (Amended) The semiconductor assembly according to claim 38, wherein said wetting agent layer includes silane.

B⁹ 40. (Amended) The semiconductor assembly according to claim 38, wherein said wetting agent layer includes at least one layer.

41. (Amended) The semiconductor assembly according to claim 38, wherein said wetting agent layer comprises one of glycidoxypopyltinethoxysilane and ethyltrimethoxysilane.

42. A semiconductor assembly comprising:
a semiconductor device having an active surface;
a substrate having an upper surface;
a wetting agent located on a portion of one of said active surface of said semiconductor die and said upper surface of said substrate; and
an underfill material located between said substrate and said semiconductor device.

43. (Amended) The semiconductor assembly according to claim 42, wherein said wetting agent comprises silane.

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44. (Amended) The semiconductor assembly of claim 42, wherein said wetting agent comprises at least one layer.

45. (Amended) The semiconductor assembly according to claim 43, wherein said silane comprises any one of glycidoxypolytinethoxysilane and ethyltrimethoxysilane.

46. A semiconductor assembly comprising:
a semiconductor device having an active surface having at least one bond pad thereon, another surface, a first end, a second end, a first lateral side and a second lateral side;
a substrate having an upper surface having at least one circuit thereon, a first side wall, a second side wall, a first lateral side wall and a second lateral side wall;
at least one bump connecting said at least one bond pad on said active surface of said semiconductor device to said at least one circuit on said upper surface of said substrate, said at least one bump forming a gap between said semiconductor device and said substrate;
an underfill material provided between said substrate and said semiconductor device; and
a wetting agent layer provided on at least a portion of one of said active surface of said semiconductor device and said upper surface of said substrate.

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47. (Twice amended) The semiconductor assembly according to claim 46, wherein said wetting agent layer comprises silane.

48. (Twice amended) The semiconductor assembly according to claim 46, wherein said underfill material substantially fills said gap between said semiconductor device and said substrate.

49. (Twice amended) The semiconductor assembly according to claim 46, said substrate further including an aperture extending therethrough.

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50. (Twice amended) The semiconductor assembly according to claim 49, wherein said aperture is located adjacent said another surface of said semiconductor device.

51. (Twice amended) The semiconductor assembly according to claim 46, wherein said wetting agent layer comprises one of glycidoxypolytinethoxysilane and ethyltrimethoxysilane.

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52. (Amended) A semiconductor assembly comprising:
a semiconductor device having an active surface;
a substrate having an upper surface;
an underfill material provided between said substrate and said semiconductor device; and
a wetting agent layer provided on a portion of said active surface of said semiconductor device and a portion of said upper surface of said substrate.

53. (Twice amended) The semiconductor assembly according to claim 52, wherein said wetting agent layer comprises at least one layer.

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54. (Twice amended) The semiconductor assembly according to claim 52, wherein said wetting agent layer comprises one of silane, glycidoxypolytinethoxysilane and ethyltrimethoxysilane.

55. (Twice amended) A semiconductor assembly comprising:
a semiconductor device having an active surface having a plurality of bond pads thereon;
a substrate having an upper surface having a plurality of circuits thereon;
a plurality of bumps connecting said plurality of bond pads on said active surface of said semiconductor device to said plurality of circuits on said upper surface of said substrate, said plurality of bumps forming a gap between said semiconductor device and said substrate;
an underfill material provided between said substrate and said semiconductor device; and
a wetting agent layer provided on said active surface of said semiconductor device and on said upper surface of said substrate.

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56. (Twice amended) The semiconductor assembly according to claim 55, wherein said underfill material substantially fills said gap between said semiconductor device and said substrate.

57. (Twice amended) The semiconductor assembly according to claim 55, further comprising an aperture extending through said substrate.

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58. (Twice amended) A method for attaching a semiconductor assembly, said method comprising:
providing a semiconductor device having an active surface;
providing a substrate having an upper surface;
applying a wetting agent layer to one of said active surface of said semiconductor device and said upper surface of said substrate;
connecting said semiconductor device to said substrate so that said active surface of said semiconductor device faces said upper surface of said substrate; and
applying an underfill material between the substrate and the semiconductor device.

59. (Amended) The method according to claim 58, wherein applying said wetting agent layer comprises any one of a dispensing method, a brushing method, and a spraying method.

60. (Amended) The method according to claim 58, wherein said wetting agent layer comprises at least one layer.

61. (Twice amended) The method according to claim 58, wherein said wetting agent layer comprises one of silane, glycidoxypolytinethoxysilane, and ethyltrimethoxysilane.

62. (Amended) A method for attaching a semiconductor assembly, said method comprising:
providing a semiconductor device having an active surface, a first end, a second end, a first lateral side end and a second lateral side end;
providing a substrate having an upper surface, a first side wall, a second side wall, a first lateral side wall and a second lateral side wall;
applying a silane layer to one of a portion of said active surface of said semiconductor device and a portion of said upper surface of said substrate;
connecting said semiconductor device to said substrate so that said active surface of said semiconductor device faces said upper surface of said substrate; and
applying an underfill material between said semiconductor device and said substrate.